

AquaScience Research Group, Inc.

EASY HAULER™

Shipping Water Ammonia Control in a Bolus

PURPOSE AND BENEFITS

EASY HAULER™ is a unique water conditioner, in a bolus form, that has been scientifically formulated to remove, and thereby detoxify, ammonia from water in live-hauling tanks and shipping bags used for all types of fishes and shellfish, other aquatic invertebrates, amphibians and aquatic reptiles. Additionally, **EASY HAULER™** removes and detoxifies chloramines and chlorine from water used for holding, culturing or hauling/shipping. **EASY HAULER™** should be used (1) for live-haul containers, during transportation of live fishes, amphibians, or aquatic invertebrates, to control and eliminate ammonia in the shipping water, (2) when conditioning new water for aquariums, tanks, ponds, and live-haul containers, (3) after or during water additions, (4) before adding new plants, invertebrates, fishes or amphibians to an existing aquarium, tank, or pond.

WATER CONDITIONING; GENERAL CONSIDERATIONS

Water conditioning is the process of altering water so that aquatic life can survive and thrive in it. Municipal water sources are treated so that the water delivered to the tap is free of viable disease-causing bacteria, viruses and other organisms as well as appearing clean and clear and being free of disagreeable odors and flavors. While such water is typically suitable for human consumption with no further treatment it is almost always quite deadly to aquatic life.

In broad terms, a water conditioner must remove or mitigate those substances which are toxic to aquatic life and add those substances which promote the health and well being of aquatic life. **EASY HAULER™** is just such a water conditioner and continues the long tradition of powerful and safe water conditioners developed and distributed by AquaScience Research Group, Inc.

Shipping and hauling present entirely different situations. Although it is always good practice to start with the cleanest water possible (e.g. tap water) during long shipments (more than a few hours) dissolved oxygen, DO, levels can drastically decline and both carbon dioxide, CO₂, and ammonia levels can drastically increase. The problems associated with low DO and high CO₂ levels are well known and can be controlled with good aeration during hauling or by using pure oxygen in shipping bags along with a buffer (to counter the build-up of CO₂). The control and elimination of ammonia is also important and this is where **EASY HAULER™** is key.

WATER CONDITIONING; SPECIFIC CONSIDERATIONS

Water from different sources will have different problems which need to be corrected before it can be safely used for aquariums and ponds.

CHLORINE: This is the most commonly used disinfectant substance found in tap water in the world. This is because it is highly effective and inexpensive and the technology, in water treatment, is well documented and understood. The chlorine content of any water sample can be easily determined with available chlorine test kits. The best kind of kit is one which will give two different, but related, measurements: (1) "free, available chlorine" and (2) "combined available chlorine".

In the United States the federal Environmental Protection Agency (EPA) and various federal, state and local public health agencies have required that for overall human health that the amount of trihalomethanes (mostly as chloroform, CHCl₃) be significantly reduced or totally eliminated from drinking water. The source of trihalomethanes in drinking water comes mainly from the reaction of "free, available chlorine" with low levels of dissolved organic substances in the treated water.

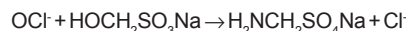
The obvious problem with reducing "free, available chlorine" is that disease-causing organisms (e.g. polio virus, typhoid fever bacteria, and fecal coliform bacteria) would likely make it through the water treatment process and arrive at the customers' taps.

"Free, available chlorine" is known, chemically, as "hypochlorite". The hypochlorite ion, OCl⁻, is the same ion that is found in common, household bleach products. As every homemaker knows, bleach is one of the best disinfectants available. Some small water treatment companies even "batch treat" their water supplies by adding the required amount of industrial bleach solution to a large tank of water before it gets distributed through the water supply system. The larger water treatment companies simply add chlorine gas directly to the water treatment stream and thereby produce the hypochlorite *in situ*.

The actual concentration of hypochlorite in the delivered water will vary from day to day and from season to season depending upon the conditions of the feed water and how the chlorine is added to the water.

The removal of chlorine; called "dechlorination" is relatively simple and can be achieved by a number of chemical substances. In addition, when water contained almost exclusively "free, available chlorine" it could be strongly aerated for a few days at room temperature and most (but usually not all) of the chlorine would dissipate. This was called "aging" the water.

The actual chemical reaction that occurs between hypochlorite ions and **EASY HAULER™** is illustrated in the following chemical equation:

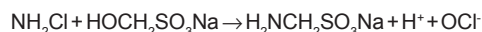


This results in the formation of chloride, Cl⁻ and sulfate, SO₄⁻² ions. As natural water sources around the US and, indeed, around the world became more and more polluted it became necessary to more aggressively treat water to insure a healthy product. This also meant adding increasing amounts of chlorine so that the water treatment agencies could insure that the chlorine residual being delivered to the customer was sufficient to maintain safe water throughout the ever aging distribution systems.

As chlorine content (as "free, available chlorine") increased so did the trihalomethane content. Trihalomethanes are known cancer-causing agents (carcinogens). To counteract the trihalomethane threat and still provide safe water it was known that by increasing the "combined, available chlorine" content one could both make the water safe and eliminate the carcinogens. "Combined, available chlorine" is better known as "chloramines".

CHLORAMINES: These substances are formed from the reaction between chlorine (or hypochlorite) and ammonia or ammonium compounds in water. There are three substances which can be called chloramines. These are (1) monochloramine, NH₂Cl, (2) dichloramine, NHCl₂, and (3) trichloramine, or nitrogen trichloride, NCl₃. The formation of these compounds are relatively easy to understand if one looks at the ammonia molecule, NH₃, which consists of a central nitrogen atom, N, with three hydrogen atoms, H, attached. Any or all three of the hydrogens can be removed in a chemical reaction and each can be replaced by a chlorine atom, Cl.

The chemical reaction between monochloramine and **EASY HAULER™** is illustrated by the following chemical reaction:



The OCl⁻ is hypochlorite. This ion then reacts with the sulfonate end of the **EASY HAULER™** molecule for form harmless chloride ions, Cl⁻ (see the previous section "**CHLORINE**").

In water treatment the first such compound, monochloramine, is the

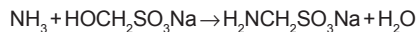
most desirable due to its stability in solution and its ability to kill viruses, bacteria and other microorganisms. In actual practice, there is always a small percentage of the total chloramine content present as dichloramine, but never any trichloramine. The trichloramine is very unstable and rapidly decomposes to free nitrogen and chlorine (that's why one should never mix bleach and household ammonia (or ammonia-containing cleaners)).

When dechlorinated with ordinary dechlorinators the chloramines release the bound ammonia into the water. In addition, the chloramines are resistant to dissipation, even when the water is strongly aerated. The removal, or destruction, of chloramines is called "dechloramination". There is only one substance which not only dechloraminates water, but is also stable in solution, is nontoxic and has been determined by the United States Food and Drug Administration (FDA) that it does not come under their regulation. **EASY HAULER™** is, therefore, suitable for use on fishes and aquatic invertebrates intended for human consumption. This substance is found in **EASY HAULER™** and is protected by US and foreign patents.

AMMONIA: Ammonia comes from many sources in aquariums and ponds. These include accumulated and decomposing feces, uneaten food and dead plants. In aquariums, however, it has been shown that the majority of the ammonia in the water comes from the living fishes. Fishes expel ammonia directly into the water from exchange sites on their gills. This means the ammonia enters the water directly without having to be first mineralized from feces, etc. This is why starved fishes will still pollute their water with ammonia even though little or no fecal matter is produced.

The actual molecular or ionic form of the ammonia present in the water is directly dependent upon the pH, temperature and salinity. The pH is the most important factor affecting the equilibrium between molecular (= "free"), NH_3 , and ammonium ion (= "ionic ammonia"), NH_4^+ . As the pH increases the percentage of molecular ammonia increases, and as the pH decreases the percentage decreases. Another way of understanding this is to remember that at acid pH's (pH < 7) the ammonia becomes less toxic to the fishes and at alkaline pH's (pH > 7) it becomes more toxic. **EASY HAULER™** reacts with ammonia in its free, or unionized form. **EASY HAULER™** will not only remove the "toxic ammonia" but due to the concentration present in standard dosages it will also remove all the ammonia as the equilibrium between ammonia and ammonium ion shifts as the NH_3 is consumed in the reaction. At low pH's this reaction proceeds slower than at pH's above 7, but in practical terms the reaction proceeds quickly enough to provide complete ammonia removal in an hour or less.

The actual chemical reaction between ammonia and the active ingredient in **EASY HAULER™** is shown below:



The reaction product, $\text{H}_2\text{NCH}_2\text{SO}_3\text{Na}$, an aminomethanesulfonate salt, is nontoxic and is capable of being metabolized by ammonia-oxidizing (nitrite) bacteria. If the **EASY HAULER™** is dosed at levels higher than needed to react with the ammonia present in the treated water, the excess may react further with the aminomethanesulfonate salt. This secondary reaction, however, will proceed slower than the initial reaction, and dosing with excess **EASY HAULER™** to react with anticipated ammonia levels, such as in shipping bags or tanks, over a long period is recommended. The aminomethanesulfonate salt is stable at pH levels less than 9.0; at higher pH levels the compound will start to react with hydroxide ions, OH^- , and some free ammonia may be produced.

Unlike other water conditioners which claim to remove toxic ammonia, **EASY HAULER™** will do so even if the pond, tank, or aquarium is not cycled, is overstocked or is improperly filtered (this is why **EASY HAULER™** can be used in live-haul tanks and shipping bags where there is no filtration and where the number of fishes per volume of water is typically several times that found in an aquarium, tank or pond). Additionally, when using **EASY HAULER™** to remove ammonia there is no need to do water changes nor to vigorously aerate the water to facilitate its action. This does not mean that **EASY HAULER™** should be used instead of proper water maintenance, but

when **EASY HAULER™** is used water management is made more efficient and effective.

SPECIFICATIONS

EASY HAULER™ is a single-phase, dechlorinating (chlorine removing), deaminating (ammonia removing), and dechloraminating (chloramine removing) agent. It is manufactured into a bolus weighing 31.4 grams (upon long-term storage the product may develop a very slight odor) that is soluble in water. Each bolus is scored in the middle for easy breaking (each half bolus treats 50 gallons of water).

Dosage: use 1 bolus per 100 gallons, or ½ bolus per 50 gallons, of water to control 1.0 mg/L of total ammonia (= 0.85 mg/L total ammonia-nitrogen). Additional boluses may be used, as needed, to control anticipated or existing ammonia concentrations. If the usual total ammonia concentration for a given shipping or hauling operation is known, the needed dosage of **EASY HAULER™** can be added at the start of the operation. If the total ammonia concentrations are not known prior to starting a shipping/hauling operation the water should be tested at regular intervals and the required dosage of **EASY HAULER™** should then be added.

FOOD FISH USE

EASY HAULER™ may be used on aquatic animals intended for human consumption. The United States Food & Drug Administration (FDA) has determined that the active ingredient in **EASY HAULER™**, **ClorAm-X™**,



does not come under its jurisdiction. This means **EASY HAULER™** may be used in water with fishes and aquatic invertebrates (e.g. lobsters, shrimp, crabs, clams, oysters) intended for human consumption. For a copy of the FDA's "letter of determination" please write or fax us.

CONTRAINDICATIONS

EASY HAULER™ is not a medication, chemotherapeutic agent nor an economic poison and is not indicated for the treatment or control of any specific or general disease condition in aquarium organisms nor for the control of any pests.

If used to remove large concentrations of ammonia (>1.0 mg/L as NH_3) in water with little (<50 mg/L as CaCO_3) or no alkalinity the pH should be monitored. If the pH declines (by more than 0.3 units) simply add sufficient sodium bicarbonate (baking soda) to boost both the pH and the alkalinity.

STABILITY

EASY HAULER™ boluses and ingredients are stable for an indefinite period if kept in its original container. **EASY HAULER™** must be stored in a dry place; storage in hatchery buildings or other places with high humidity may cause the boluses to degrade. Boluses that have been broken in half may be returned to the original container for later use.

COMPATIBILITIES

WITH OTHER WATER ADDITIVES: **EASY HAULER™** is compatible with most other water conditioners. It is incompatible with strong oxidizing agents such as potassium permanganate (KMnO_4) and its solutions. Due to its ability to reduce certain dyes **EASY HAULER™** should not be used with treatments containing malachite green or methylene blue or related dyes. **EASY HAULER™** is compatible with most antibiotics. **EASY HAULER™** can be added directly to recirculating systems with active biological filtration; it will not interfere with, nor short-circuit, the nitrification process.

WITH TEST KITS: During live-hauling operations it is often good practice to test various chemical and physical parameters of the hauling water. This is specially true for first-time operations where all of the possible parameters are not well defined beforehand.

Water treated with **EASY HAULER™** will give false (high), off-scale readings with ammonia test kits that use Nessler's reagents. Water treated with **EASY HAULER™** is compatible with most salicylate and phenol/hypochlorite test kits. Contact AquaScience if there is a question about ammonia test kit compatibilities.

Water treated with **EASY HAULER™** is compatible with all known nitrite and low-range nitrate test kits.

Water treated with **EASY HAULER™** is incompatible with Winkler and modified Winkler dissolved oxygen (DO) test kits. These kits will give false, low, or zero, readings. However, water treated with **EASY HAULER™** is compatible with indigo/carmine dissolved oxygen test kits and with dissolved oxygen meters.

WITH COLORIMETERS: Refer to the information above about test kit reagent compatibility. AquaScience has valuable information about ammonia testing using colorimeters and methods which require the use of a blank determination; please contact us for details.

WITH ELECTRONIC METERS AND ISE'S: When testing treated water with an ammonia ion-specific electrode (ISE) and electronic meter omit the step where 10N sodium hydroxide solution is added. Instead, dilute the electrode's picric acid filling solution with deionized water (to increase the electrode's sensitivity) at a ratio of 1 (filling solution) : 9 (deionized water), by volume, and measure the free ammonia directly. Refer to available charts to calculate the total ammonia from the free ammonia value determined and the known temperature, pH and salinity. Contact AquaScience for more information about how to do measurements with an ammonia ISE in water treated with **EASY HAULER™**.

TOXICITIES

The active ingredient, **ClorAm-X™**, is not known to be toxic to any fishes, amphibians, aquatic invertebrates or aquatic plants.

Solutions containing approximately 21% **ClorAm-X™** have been shown to be nontoxic and nonirritating to humans. Acute mammalian toxicity tests were performed on rats and skin and eye irritation (Draize tests) were performed on rabbits. The tested solutions of **ClorAm-X™** were found to be nontoxic at oral doses of 5,000 mg/Kg or less.

Double blind toxicities studies were performed on American lobsters to determine if toxic metabolites accumulated in the edible tissues of the lobsters. No significant differences were found, in aqueous and ether extracts of the lobsters' edible tissue, between exposed and unexposed (control) animals.

PACKAGING

EASY HAULER™ is packaged in boxes of 25-count, 31.4 gram boluses. Six, 25-count boxes are packaged in a master shipping case.

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